

Advanced LED Illumination for Fluorescence Microscopy

# X-Cite® XLED1

Delivering maximum power at the sample plane with unsurpassed control and speed for live cell imaging

Optimized excitation with high power LED illumination at the sample plane

Instant switching between wavelengths; ideal for multi-color live cell imaging

High-Speed automation with advanced internal pulse generation and external triggering options

Ease of use through an interactive touch screen controller and intuitive user interface



LUMEN DYNAMICS  
PUTTING YOU IN CONTROL

X-Cite®  
—XLED1

# The X-Cite® Advantage.

Designed with researchers in mind, the X-Cite® XLED1 combines high power excitation specificity with high-speed imaging capabilities for maximum control, flexibility and ease of use.

Inspired by over 26 years of light applications expertise, X-Cite® XED1 is the superior choice in LED technology ideal for microscopy applications involving fast, automated multi-color live cell imaging.

## With the recent advancements in LED technology, researchers can benefit from the intrinsic advantages of LED:

- Reliability with long lifetimes
- Fast on/off switching with no warm-up required
- Elimination of frequent mercury and xenon lamp changes
- No need for mechanical shutters - prevents vibration and increases imaging speed
- Optimized excitation through narrow bandwidth and diverse wavelengths
- Reduced phototoxicity and bleaching
- Compact size, low heat generation, and energy efficiency
- Stability (spatial and temporal)
- Increased excitation specificity without the high cost of lasers

## What does X-Cite® XLED1 offer?

- Uniform and stable, high-power LED illumination
- Narrow LED bandwidth that reduces crosstalk between fluorophores
- Efficient wavelength mixing for uniform and powerful illumination of up to four fluorophores at the sample plane
- Fast triggering both internally and externally with pulse duration as short as 10µs for advanced system control
- Instantaneous wavelength switching for fast multi-color imaging applications
- Ultra-fine control of intensity (0.1%) for precise adjustments to output power
- Ease of use for a novice or an expert microscopist
- Large display and easy to use interactive and intelligent touch screen controller
- Simple plug and play modules allowing fast and easy system reconfiguration
- Compatibility with third party software for simplified integration into existing experimental set-ups
- 20,000 hours (or 3 years) LED module guarantee

X-Cite® XLED1 represents the industry's next generation of LED illumination for fluorescence microscopy applications. The XLED1 includes high power LEDs at 385nm, 460nm and 525nm as a standard configuration to image the most commonly used staining trio and additional options for niche applications. The X-Cite® XLED1 offers superior power output and advanced control for high-speed automated fluorescence imaging.

Harnessing the intrinsic advantages of solid-state LED technology, the X-Cite® XLED1 provides unprecedented wavelength and power stability over extended lifetimes. Integrated with state-of-the-art technology that provides full control over LED intensity and signaling, the X-Cite® XLED1 can trigger, or be triggered by, external hardware. By combining these features with an easy-to-use intelligent controller, the XLED1 offers maximum control with the convenience and versatility of an X-Cite®.

### Maximum Power and Specificity for your Application

The XLED1 offers up to four high-powered LEDs with narrow spectral profiles that enable excitation specificity while maintaining high power at the peak excitation wavelength via efficient optics including optimized microscope adaptors. In certain applications, excitation filters may not be required, and the use of multi-band filters negates the need to rely on a filter wheel, thus enabling high speed imaging.

The X-Cite® XLED1 is well-suited for applications including fluorescence probes, conjugates and the ever-increasing fluorescence proteins along with the popular Alexa, ATTO dyes and traditional DAPI, FITC, TRITC and Cy dyes. The XLED1 system maximizes excitation specificity to which laser users are accustomed, but without the high cost of lasers (*Figure 1*).

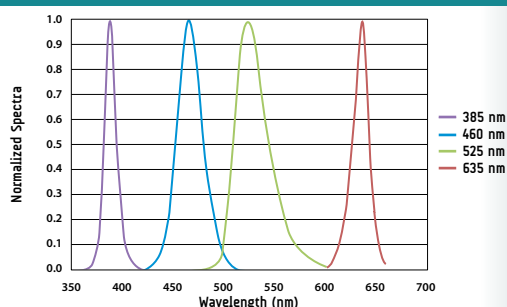
### Intuitive Touch Screen Controller

The X-Cite® XLED1 has been designed with an intuitive Graphical User Interface (GUI) for easy navigation and advanced system control (*Figure 2*). With a touch screen display, users have the ability to view LED and system status while ensuring peace of mind when exchanging modules. Advanced operators and lab managers can manage more complicated imaging protocols through the triggering screen (*Figure 3*). A unique virtual oscilloscope feature plots all programmed channel and trigger waveforms (*Figure 4*), ensuring proper system set-up, as well as potentially eliminating the need for external electrical or optical test equipment. For those who choose to control the system through their own software, a full SDK is available, as well as drivers for common software packages.

### Unparalleled Control

The XLED1 system allows operators to control the intensity of each LED in large steps through a slider, or through smaller steps using simple up and down arrows associated with each LED. With the touch of a button, intensity levels used from past experiments can be set via a numerical value of the required intensity. The XLED1 also offers the ability to save optimized settings for future experiments with up to five user profiles that are password protected. By simply logging in when starting an experiment and logging out at the end of the day, individual settings will be saved for future use.

Figure 1. LED Spectral Profiles





and the new XLED1 LED light source from Lumen Dynamics to be extremely  
in a multi-user environment, providing great excitation for all of our favorite  
protein proteins.

Molecular Imaging Center, UC, Berkeley



### Ideal for Live Cell Imaging

The X-Cite® XLED1 system is ideal for single or multi-color live cell imaging. With super-fine control of power intensity as little as 0.1% increments, users can fine tune the exact power required for optimal imaging. With instantaneous switching between wavelengths and ability to pulse each LED for a defined time period or continuously, the XLED1 system will allow you to image for long time periods while minimizing photobleaching and phototoxicity when compared to alternative light sources.

### Programmable for High Speed Automated Imaging

Designed with sophisticated triggering capabilities, the XLED1 allows full control of the LEDs according to experimental needs. Signals can also be directed into each or all of the LEDs through TTL inputs generated by external hardware connected to the XLED1. Specific timing (s, ms and  $\mu$ s) can be set to turn each LED ON and OFF defined

by the experimental design, as well as programming the system to transmit a timed signal to peripherals (e.g. stages, cameras, electrophysiology rigs) connected to the XLED1.

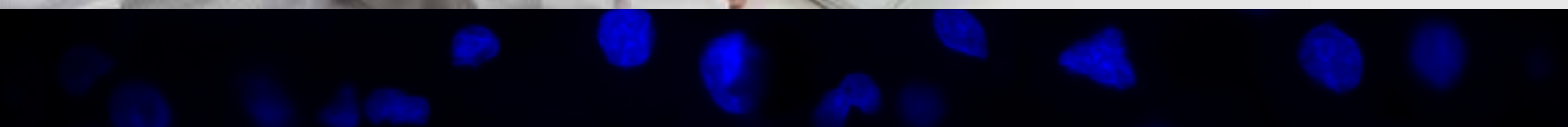
### Easy to Use with Plug and Play Modules

The XLED1 offers easy replacement of LEDs with additional modules that may be required for niche applications for greater flexibility. Just simply plug and play - no wires to reconnect and no need for special tools.

Optical table visualization (*Figure 5*) on the maintenance screen provides researchers with useful system configuration information and also pinpoints the location and details of each LED source and dichroic, making reconfiguration straightforward.

### Setting the New Standard for LED Illumination

X-Cite® is recognized as the industry standard for fluorescence illumination and was the first to introduce a commercial replacement for traditional HBO systems in 2002. The X-Cite® XLED1 represents a new generation of LED microscopy illuminators with optimum LED power where it is most essential – at the sample – while offering the convenience and ease of use researchers have come to expect from an X-Cite®.



What XLED1 offers...	How researchers benefit.
High power at the sample plane (385nm, 460nm, 525nm, optional 635nm)	Increased excitation power where it matters most to excite/uncage fluorophores – at the sample
Narrow LED bandwidth	High signal to noise ratio; reduces crosstalk between fluorophores leading to high signal specificity
Instantaneous wavelength switching	Enables fast multi-color image acquisition and pulsing applications (down to 10µs)
Fast ON/OFF	Eliminates vibration and latency of mechanical shutters, allowing precise, short exposure times to limit photobleaching and phototoxicity
Advanced triggering and pulsing options	Flexibility with experimental design and system control
Plug and play user-replaceable modules	Easy reconfiguration for new experiments
Optimized X-Cite® adaptors	High efficiency coupling to a wide variety of microscopes currently available with X-Cite® products
Uniform and stable illumination	Reliable and consistent image data
Interactive touch screen and intuitive user interface	Ease of use; no advanced training required
Intelligent controller with automatic LED detector	Verifies system set-up and ensures worry-free module exchange
0.1% intensity control increments	Repeatable illumination and optimal imaging



X-Cite® XLED1 offers superior power output and advanced control for high-speed automated microscopy in LED fluorescence illumination.

Designed with researchers in mind, the X-Cite® XLED1 combines excitation specificity and high speed imaging capabilities for maximum control, flexibility and ease of use.

Recognized as the industry standard in fluorescence illumination, X-Cite® offers the XLED1 as the next generation of advanced LED technology for microscopy applications.

## SPECIFICATIONS

<b>XLED1 package includes:</b>	XLED1 (system + 3 LEDs), XLED1 touch screen controller, additional modules (if ordered), user manual (CD), quick start guide, liquid light guide, microscope adaptor, power cord, trigger cables, USB cable
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### XLED1 System

<b>Wavelengths:</b>	385nm/13nm (central/FWHM) 460nm/25nm 525nm/35nm 635nm/17nm (optional)
<b>Dimensions:</b>	8.5" (W) x 8" (H) x 15" (D) (22cm x 20cm x 39cm)
<b>Weight:</b>	~7.3kg, ~16lbs (full system)
<b>Supply:</b>	Universal input of 100-240Volts AC, 50-60Hz. Fused at 6.3A
<b>Connectivity:</b>	USB type-B female Trigger Input (TTL-compatible) Sync Output (TTL-compatible)
<b>Triggering:</b>	Internal/External User-defined per channel Global trigger input User-defined free-running or single shot pulse modes Internal triggering generated from internal pulse generator 10µs (min), up to 18 hours (max)
<b>Sync Out:</b>	Mapped echo of LED cycles on separate output pins
<b>Sync Out Phase Control:</b>	Individual control of sync phase advance/retard (half of max cycle duration)

### XLED1 Touch Screen Controller

<b>Screen:</b>	Medical/Industrial grade 7" TFT viewable diagonal. Resistive touch screen with 16:9 aspect ratio and LED backlight with adjustable intensity
<b>Resolution:</b>	800 x 480 pixels
<b>Display Viewing Area:</b>	6" (W) x 3.5" (H) (15cm x 9cm)
<b>External Dimensions:</b>	8" (W) x 2.5" (H) x 5.5" (D) (20cm x 7cm x 14cm)
<b>Program:</b>	Lumen Dynamics proprietary graphical user interface
<b>Connectivity:</b>	~2.5m connectorized power and data combo cable
<b>Power:</b>	<10 watts
<b>Certifications:</b>	CE Marked, Certified to IEC, Canadian and US standards, RoHS compliant
<b>Warranty:</b>	XLED1 System, XLED1 touch screen controller and XLED1 LED drivers: 12 months from shipping. LED modules: 20,000 hours or 3 years
<b>Patents:</b>	Product is sold in agreement with U.S. patent 6,154,282



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Images acquired using an XLED1 by Dr. Kavita Aswani, Senior Applications Scientist, Lumen Dynamics

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